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(Red)

September 29, 1992
88C2076-4X

Mr. Randy Sturgeon
U.S. Environmental Protection Agency
Region III
841 Chestnut Street
Philadelphia, PA 19107

Re: Supplemental Issues to FFS
Du Pont Newport Site
Institutional Control Monitoring Program

Dear Mr. Sturgeon:

Woodward-Clyde Consultants, on behalf of Du Pont, is pleased to submit herein the post-remediation monitoring program as a supplement to institutional control options presented in the Focused Feasibility Study (FFS, WCC August 27, 1992) for the Du Pont-Newport Site. This evaluation was conducted per the request of EPA to provide more depth to institutional control options presented in the FFS, and is designed to monitor the efficacy of remedial action at the Site. This evaluation was conducted concurrent with preparation of the FFS and has recently been completed.

We hope that the EPA will be able to incorporate this monitoring program into the Record of Decision (ROD) for the Du Pont-Newport Site. If you have any questions or need clarification of any portions of this evaluation, please do not hesitate to call Joel Karmazyn at Du Pont or Jim Buczala at Woodward-Clyde.

Very truly yours,

Jon I. Parker
Senior Staff Scientist

James P. Buczala
Project Geologist

cc: M. Springer - EPA
H. R. Preston - EPA
B. Davis - EPA
P. Knight - EPA
R. Burr - USFWS
D. Henne - Dept. Int. (2)
A. Hiller - DNREC (3)
M. Watson - CIBA-GEIGY

B. Butler - Du Pont
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L.A. Wolfskill - WCC
S. Sury - CIBA-GEIGY

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**INSTITUTIONAL CONTROL MONITORING PROGRAM
SUPPLEMENTARY FFS ISSUES
DU PONT-NEWPORT SITE
NEWPORT, DELAWARE**

**1.0
INTRODUCTION**

As part of the institutional control options for Remedial Action at the Du Pont-Newport Site, a monitoring plan will be implemented to measure the effectiveness of the Remedial Action. This plan is presented to supplement the institutional control option presented in the Focused Feasibility Study (FFS, WCC August 27, 1992) for the Du Pont-Newport Site. The plan would involve the collection of samples on a regular schedule for various analyses from sample stations located in pathways leading from areas where Remedial Action has taken place. Monitoring of the sample stations would be initiated after completion of the anticipated construction activities associated with capping the North and South Disposal sites, removal of selected areas of sediment from the wetlands, and capping of Area 1 Christina River sediments. In addition, sample stations may be set up after detailed delineation of impacted wetlands is completed during the Remedial Design/Remedial Action (RD/RA) process, in order to monitor the natural improvement of impacted areas. A discussion of sample station locations, monitoring variables, frequency of sampling and criteria for identification of trends are discussed below.

SAMPLE STATION LOCATIONS

Sample stations have been tentatively located in areas immediately downgradient to areas where remedial measures (capping of North and South Disposal sites, removal of sediment from Areas B and D of the wetlands, and capping of Area 1 Christina River sediments) have been proposed to be implemented (see Figures 1, 2, and 3).

Two locations for the collection of surface water and sediment samples have been selected downgradient of remedial activities associated with the North Disposal site drainageway (removal of sediment from Area B and capping of the North Disposal site) (Figure 1). These locations will provide data to identify any potential trends in monitoring variables suggesting further impact in the River and in the wetlands to the west of Area B, respectively, from the North Disposal site drainageway and the North Disposal site. One of these stations has been located at the mouth of the North Disposal site drainageway (Area B), and one has been located in a drainageway in the wetlands to the west of the North Disposal site drainageway (Area C).

One location for the collection of surface water and sediment samples has been selected in the South Disposal site wetlands (Figure 2). This location will provide data to identify any potential trends in monitoring variables suggesting further impact to the southern wetlands. It is located in a drainageway downgradient to remedial activities associated with the South Disposal site as well as the southern wetlands (removal of sediment from Area D and capping the South Disposal site). This location also appears to be downgradient to surface water flow from a large portion of the southern wetlands.

Two locations have been selected for the collection of surface water and sediment samples in the Christina River: one immediately upgradient of the Site and one immediately downgradient of remedial activities at the Site (capping of Area 1 River sediment, as well as remedial activities for the North and South Disposal sites and associated wetlands) (Figure 3). These locations have been selected to measure trends

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in sediment and surface water quality. Due to the dynamic depositional nature of the River, it is anticipated that over the course of the monitoring program, fine-grained depositional patterns in the River may shift. To account for this, sampling areas, as opposed to sample stations, have been identified for sampling of River sediments. During each sampling event, an effort will be made to collect fine-grained sediment from the same location within the sampling areas as was sampled in the previous sampling event. However, if no fine-grained material is found at that location, a sample will be collected from a location containing sediment proximal to the previous location within that area.

As it is important that the sample locations are placed in areas undisturbed by remedial activities at the Site, the sample locations discussed above are subject to adjustment, depending on the actual extent of these remedial activities.

Sediment and surface water samples will be collected from each of the sample stations. These samples would be collected in a similar manner to those collected during the RI program, with sediment samples collected over a depth interval of 0 to 6 inches and water samples collected at the water surface.

In addition to the stations discussed above, sample stations may be added to the program to monitor areas of wetlands selected for natural remediation during RD/RA sample collection. The purpose of these samples would be to document improving conditions in the wetlands environment where remediation of identified impacts has been left to natural processes. In other words, at locations where "self-healing" is expected to take place through the development of peat and, eventually, the sequestering of metals (and, therefore, the reduction of metals that are bioavailable), monitoring stations would be set up to monitor these improvements. The final location of these stations will be established after the remedial actions in Areas B and D are completed.

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MONITORING VARIABLES

Three different matrices will be monitored to document the efficacy of remediation at the Du Pont-Newport Site. Samples of water and sediment (chemical and biological) will be collected and monitored over time for specific variables to document any time series trends. The variables selected will be sufficiently sensitive to changes so that significant trends do not go undetected. Simultaneously, the variables should be as quantitative as possible to enable statistical analysis to document significant trends, as opposed to relying solely on subjective judgments. In addition, a decision criterion will be established for each variable that can be used as a "trigger" which defines a negative trend warranting re-evaluation of the remedial action previously taken.

The selection of monitoring variables was based on the information presented in the Environmental Evaluation (EE, WCC August 7, 1992), Remedial Investigation Report (RI, WCC August 26, 1992), FFS, and the supplemental FFS sediment criteria evaluation (submitted to EPA on September 25, 1992). The conclusions reached in the EE indicate that metal transport pathways and receptor organisms vary among the three different habitat types present at the Site. Thus, different monitoring matrices and specific variables are appropriate for these habitats. The variable selected for: (1) the emergent wetland plant communities, (2) the North and South Disposal Site drainageways, and (3) the Christina River are discussed below.

In the emergent wetland plant communities adjacent to remedial Areas B and D, the Wetland Community Index will be utilized as the initial monitoring variable. Likewise, this same variable will be used to monitor the efficacy of remediation in any newly created emergent wetland communities.

The North and South Disposal Site drainageways will be monitored for metal concentrations to document trends in the surface water runoff in the drainageways. These samples will be analyzed for the most prevalent metals at the Site (barium,

cadmium, lead, and zinc). Three of these metals (cadmium, lead, and zinc) also pose the greatest potential toxicity to aquatic receptors.

In the Christina River, both upstream and downstream water and sediment samples will be monitored for the metal concentrations. Three samples will be collected at both high and low tide to document the natural range of dilution conditions present at the Site.

The monitoring program schedule including both seasonal timing and sampling frequency will be discussed in Section 4.0. Likewise, the development of the decision criteria for the identification of significant trends is presented in Section 5.0.

4.0

SAMPLE SCHEDULE

The sampling program will be initiated approximately six to nine months after completion of proposed construction activities, associated with the remedial program, in order to allow the ecological and chemical systems to stabilize. At least one full growing season, and possibly more, will be required to begin the re-establishment of the plant communities in the remediated wetland areas. Upon implementation of the initial monitoring program, samples will be collected twice a year: once in the spring season, and once in the fall season. This schedule will be maintained for at least the first two years of the program, after which the schedule will be reduced to once a year near the end of the growing season (in the fall) when the plant community seasonal growth is at a maximum. In the fifth year, an assessment will be made regarding the need for a continuation of the monitoring program.

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5.0

IDENTIFICATION OF TRENDS

A statistical examination of data collected for the variables presented in Section 3.0 will be used to identify any time-series trends in order to document the efficacy of remediation at the Site. Three replicate samples from each sample station will be used to calculate a mean and standard deviation value for each variable measured during any sampling event. The t-test (Wine, 1964) will be utilized to determine any significant differences between the initial sampling event mean and any subsequent sampling event mean. This approach will provide documentation of any statistically significant time-series trends for each variable measured at a station.

5.1 SURFACE WATER

Three replicate water samples will be collected at the drainageway monitoring stations and analyzed for the total and dissolved concentrations of cadmium, lead and zinc. Triplicate water samples will be collected at low and high tide in the Christina River, providing a total of six samples. Barium will not be included as an analyte since its physicochemical characteristics (e.g., solubility, chemical specialization) under the usual freshwater and marine conditions preclude the existence of the toxic soluble form and prevent the expression of toxic effect in aquatic organisms. Thus, as USEPA has concluded, a restrictive criteria for barium to protect aquatic life is unwarranted (USEPA, 1986).

The analytical results for the cadmium, lead and zinc concentrations in the water samples collected at the North and South Disposal site drainageway stations and the Christina River stations will first be compared to the USEPA water quality criteria (adjusted for site-specific water hardness) to document any exceedances.

Secondly, the replicate mean metal concentrations (plus and minus one standard deviation) will be presented in a time series plot with metal concentration on the y axis

and time (month after initial sampling) on the x axis. This technique will visually illustrate any trends. The significance of any observed trends will be statistically validated by conducting a t-test ($p = .05$) to compare the mean metal concentrations measured during initial sampling versus the results from each subsequent sampling event. A calculated t value in excess of the standard t statistic at $p = .05$ will represent a significant difference between the initial sample mean surface water concentration and the subsequent mean surface water concentration value.

5.2 SEDIMENT

Three replicate sediment samples will be collected at the wetland monitoring stations and analyzed for barium, cadmium, lead, zinc and grain size. Four sediment samples will be collected at the Christina River stations, only during the low tide sampling. All metal concentrations will be normalized for grain size in order to clarify variability in sediment metals levels due to physical and/or chemical sediment characteristics (as was requested by the EPA for the EE). A geometric mean-normalized concentration (plus and minus one standard deviation) will be plotted in a time series plot as described above for the water sample means.

The statistical significance of any observed trends over time will be tested using the t-test as described above. Any significant positive trend will be interpreted as a significant increase in sediment metal levels at that location. If a significant increase in metal concentration is observed at any location on two successive samplings, a more in-depth evaluation of the sediment at that station will be conducted. Sampling at that location will be repeated as soon as practical after the trend has been observed. These samples will be analyzed for cadmium, lead and zinc, and will also be tested for the Simultaneously Extracted Metals/Acid Volatile Sulfide (SEM/AVS, as presented in the supplemental FFS sediment criteria evaluation, WCC September 25, 1992) ratio to determine the bioavailability of the metals. If the metals are not found to be bioavailable (i.e., $SEM/AVS > 1$), then routine sampling will continue at this station and the SEM/AVS analysis will be included in subsequent monitoring for two subsequent samplings. After this, if the metals are still not bioavailable, the SEM/AVS analysis will

be discontinued. Metal analysis will be resumed until the fifth year, at which time the monitoring program will be re-evaluated. When the metals are found to be bioavailable, the sediment will be further tested using solid phase toxicity tests with an ecologically relevant species such as Chironomus tentans. The toxicity test results will be compared to similar test results at an upstream reference station.

If the toxicity test results at the site station are not significantly different from those obtained at the reference station (based on a t-test comparison at $p = 0.05$ level), then no further action will be required and routine monitoring of the metal concentration levels will be continued until the fifth year of the program. However, if the toxicity test results at the site station are significantly lower than those measured at the reference station, then these results will be used in conjunction with the other test results to re-evaluate the efficacy of the remedial actions previously implemented at the Site that affect this station.

5.3 EMERGENT WETLANDS PLANT COMMUNITIES

In the emergent wetlands in areas B and D and the adjacent wetland stations in the re-established transition zone between B/C and D/F, yearly monitoring will be conducted near the end of the growing season to evaluate the efficacy of the remediation. The Wetland plant Community Index (WCI) previously proposed by WCC will be used for this evaluation. The index values for each area will be presented on a time series plot to visually illustrate any trends. Since this is a qualitative index, no evaluation can be conducted to document any statistically significant trends. Therefore, if the WCI index declines one point in two successive sampling periods for a total of two points, this will be interpreted as a significant downward trend. In this event, wetland sediment samples will be collected as soon as possible after the trend has been detected and these samples will be analyzed for the SEM/AVS ratio to evaluate the presence and bioavailability of metals at this location. If the SEM/AVS ratio is greater than 1, these observations will be used in conjunction with all the other data collected at this location to re-evaluate the remedial action taken in this area.

5.4 SUMMARY

By including these variables and criteria for all the important matrices (water, sediment and biota), the monitoring program has great potential for detecting both both positive (improving) and negative (degrading) trends for wetland changes at the Du Pont Newport Site. It is anticipated that implementation of this monitoring program will provide an adequate evaluation of the efficacy of the remediation while simultaneously providing adequate environmental protection of the wetland resources.

6.0
REFERENCES

R.L. Wine. 1964. Statistics for Scientists and Engineers. Prentice-Hall, Inc., 671 p.

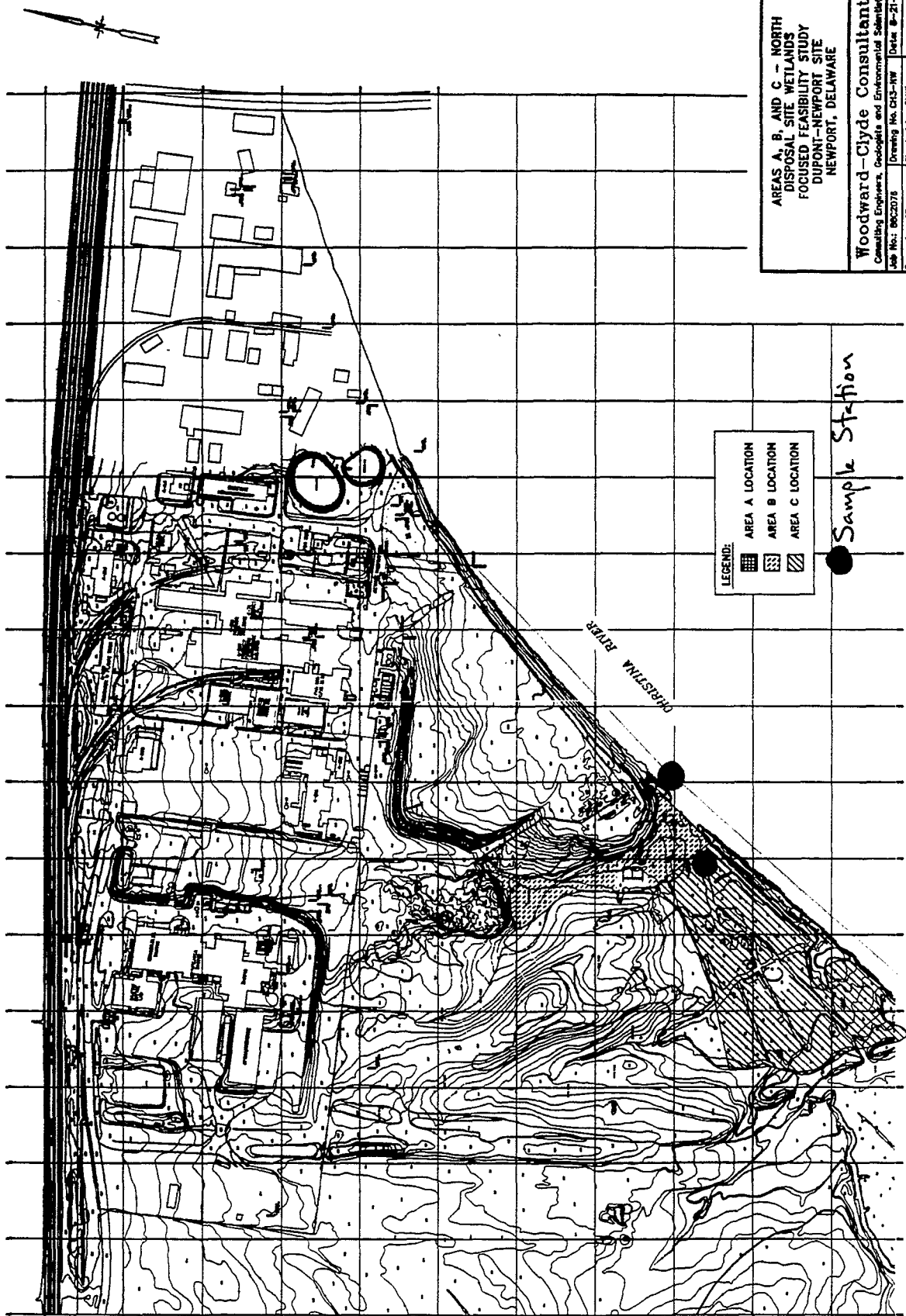
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AREAS A, B, AND C - NORTH
DISPOSAL SITE WETLANDS
FOCUSED FEASIBILITY STUDY
DUPONT-NEWPORT SITE
NEWPORT, DELAWARE

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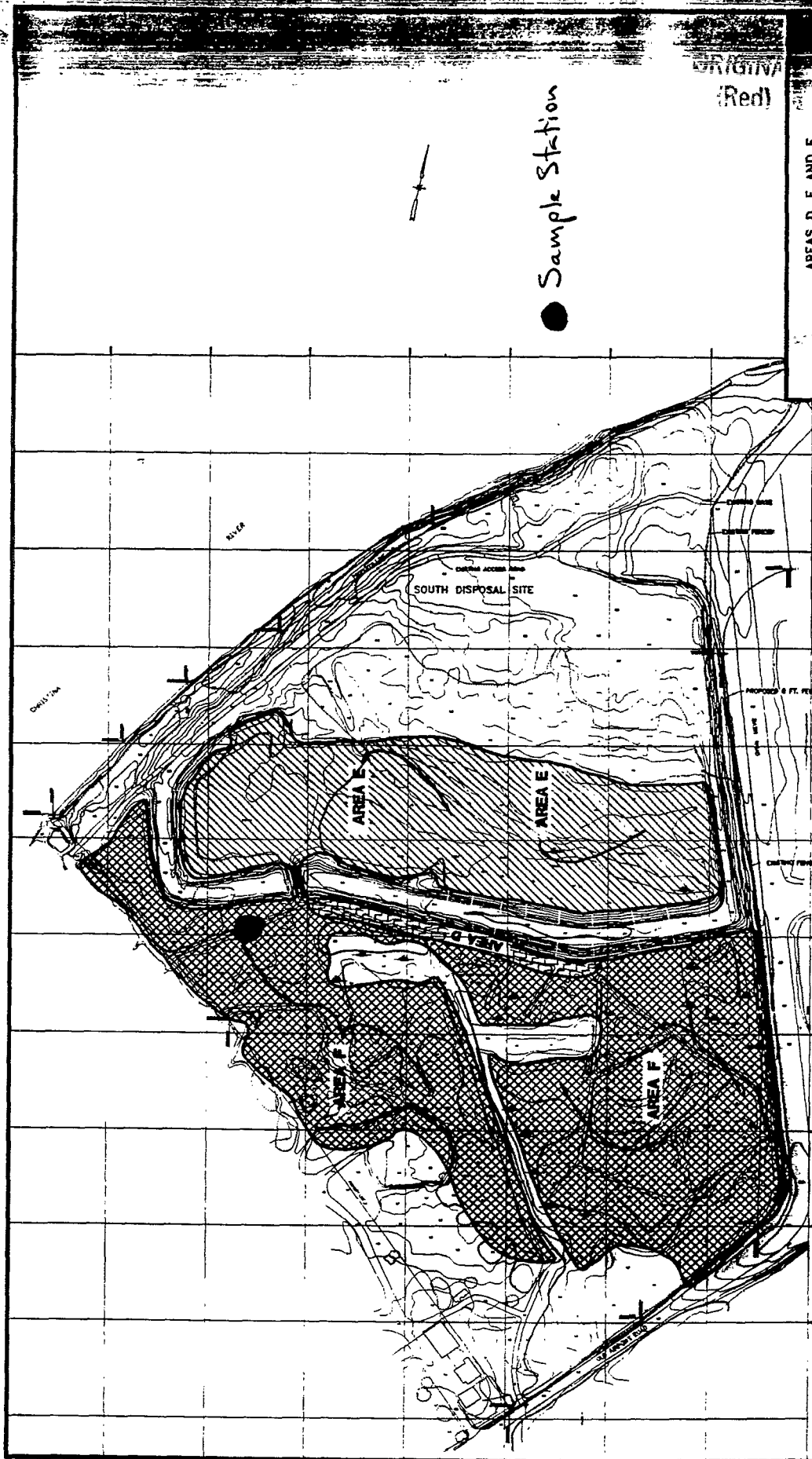
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Drawing No: C13-NW
Date: 8-21-82
Drawn by: CS
Checked by: GAW
Scale: 1" = 100'
FIGURE: 1



LEGEND:
AREA A LOCATION
AREA B LOCATION
AREA C LOCATION

Sample Station

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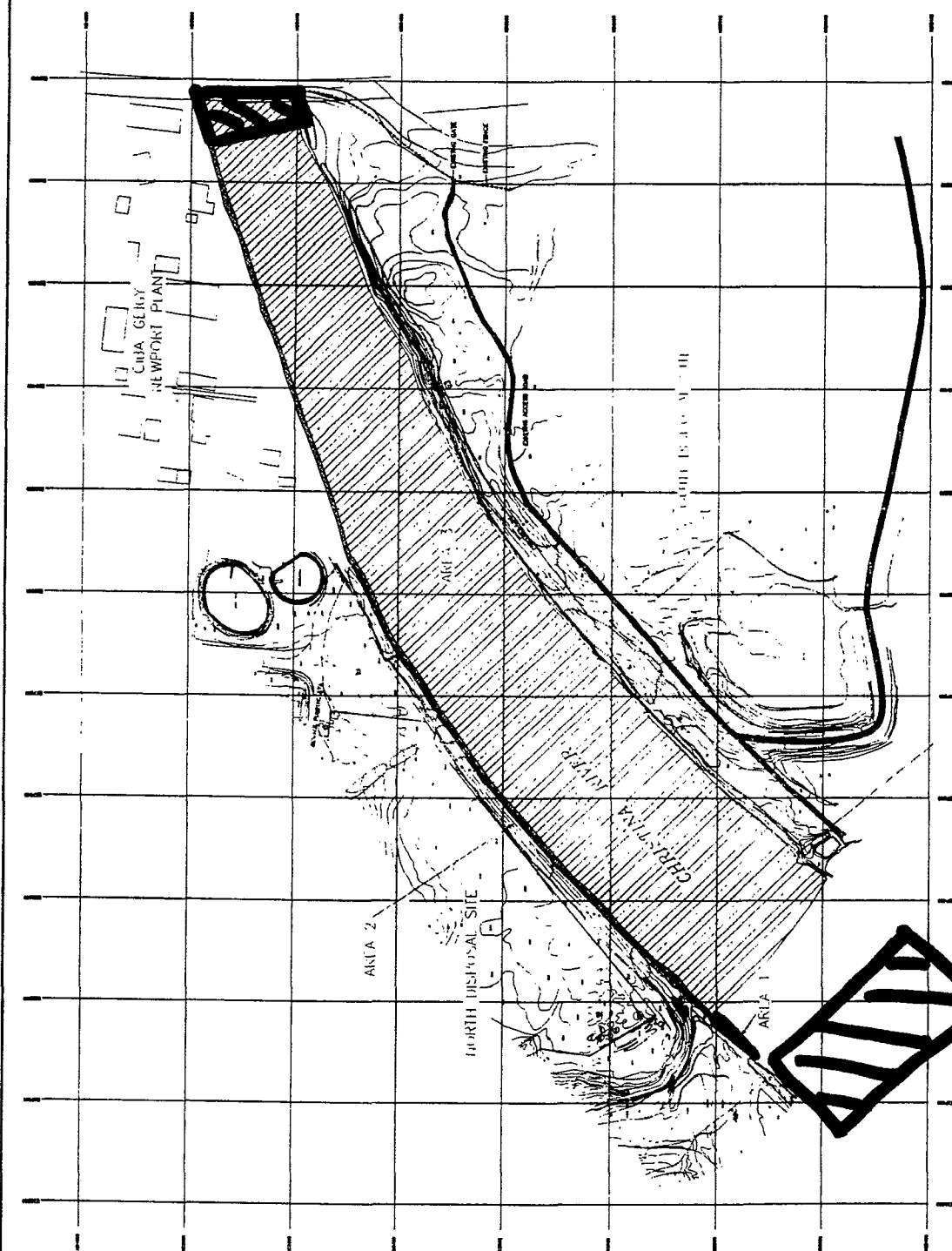
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AREAS D, E AND F
SOUTH DISPOSAL SITE WETLANDS
FOCUS FEASIBILITY STUDY
DUPONT-NEWPORT SITE
NEWPORT, DELAWARE

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Job No.: 5902076	Drawing No.: SWWETA	Date: 8-10-77
Drawn by: B.T.	Checked by: I.A.	FIGURE 7
Scale:	0 100' 200'	

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Sample Area

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AREAS 1, 2, AND 3 - CHRISTINA RIVER
FOCUSED FEASIBILITY STUDY
DUPONT-NEWPORT SITE
NEWPORT, DELAWARE

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Job No.: 86C2078	Drawing No.: CR-AA
Drawn By: C.B.	Checked By: G.M.W.
Scale:	200' 400'
FIGURE: 3	

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